

RACIAL DIFFERENCES IN BI-MANUAL DEXTERITY
OF LATIN AND AMERICAN CHILDREN

BY
EMILY O. LAMB

A DISSERTATION

SUBMITTED TO THE BOARD OF UNIVERSITY STUDIES OF THE JOHNS
HOPKINS UNIVERSITY IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

1928

BALTIMORE, MARYLAND
THE WILLIAMS & WILKINS COMPANY

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IN TESTING Latin and American children with the Stanford revision of the Binet-Simon tests, over a period of ten years, the writer arrived at the conviction that Latin children are more dexterous with their hands than American children; so this investigation has been undertaken to prove or disprove that belief.

Hollingsworth and Poffenberger (5) in discussing form-board studies of different races, made by Woodward, (15), ask, "are there characteristics of mind peculiar to different races of men, which need to be considered from the point of view of efficiency?" There is "practically no attempt to separate the facts of inheritance from the effects of education, customs and general environmental conditions." "Experiments have been made on rather simple functions, such as sensory acuity, motor ability and simple judgments. Although the traits are simple, yet they are characteristics in which peoples are supposed, in the popular minds, to differ. The upshot of all the experimental tests seems to show that the racial differences in fundamental qualities, independent of training, are slight."

Woodward (15) considered the form-board test he used to be a fair test of intelligence, and depending very little on training. He found "between

whites, Indians, Eskimos, Ainus, Filipinos and Singalese, the average differences were small and much overlapping occurred." But between these groups and the Ingorot and Nigroto from the Philippines and a few Pigmies from the Congo, the average differences were great and overlapping was small. Woodward says that the results would seem to indicate differences in intelligence, but as the fairness of the test is not beyond question, it may have been a more unfamiliar sort to these wild hunting folk than to the more settled groups.

Herrick's (4) studies of Brahman and Panchama children in South India, bring out interesting points on the question of physical maturity. At four years Brahman children exceeded American children in quickness of reaction, but at five years the American children have caught up, and from six years on the American children hold the lead, being faster at every succeeding age studied. Herrick gives as one of the causes that in the tropics children mature earlier than in colder climates, so it is not surprising that four year old Indian children should be capable of faster performance than American four-year-olds.

Paschal and Sullivan (10) gave a series of standardized performance



tests to Mexican children to attempt to determine racial differences in the mental and physical development of Mexican and American children. They found considerable overlapping in the top third of the distribution of most tests, but from the median downward the American children show increasing superiority, the difference being greater at nine years than at twelve. Less sex difference is found in Mexican children than in American children on performance tests.

Koch and Simmons (8) in an experimental study of American, Mexican, and Negro children, found that the city white children are younger, in grade for grade comparisons, than are the city Mexicans. That the city groups, whether American or Mexican, are younger for their grades than are their respective rural groups.

Murdock (9) studied 3 different racial groups in Hawaii, the Chinese, Japanese, and Korean, and found that the Chinese and Koreans were superior to the Japanese in tests involving language but in the Beta test the superiority of the Japanese is clearly shown.

Seashore (13) makes the statement in his "Psychology of Musical Talent":

"Thus we find among children those who are slow and sure, slow and erratic, quick and sure, quick and erratic, and no one seriously expects these tendencies to be altered any more than he expects the leopard to change his spots. These permanent peculiarities we call 'the personal equation.' Reymert (12) carried out a study of a series of reactions of various muscle groups, to validate Seashore's claim, on the assumption that if the personal equation existed, it would manifest itself within recognizable limits. His conclusions were that 'a distinct personal equation for speed exists,'—with the reserva-

tion, however, that this personal equation is to some extent a different one for instantaneous motor performances than for motor performances of a continuous nature."

Other findings, which seem to indicate a "personal equation" are re-quoted by Ream (11). In an experiment on tapping rates, he states that,

"Every individual has his own motor set-up, one is geared slow, and another geared fast, the chief factor—is probably a physiological openness of nerve paths which is inherited. The extended practice experiments of this study seemed to indicate that the test measures fundamental basic abilities since improvement was, on the whole, conspicuously lacking. The inference is that the motive neural set, undoubtedly an important condition of such basic ability, is inherited."

Among experiments employing but one hand at a time, is a very extensive and painstaking study by Wellman (14) on the Development of Motor Coördination in Young Children. Some of the results of her study of motor coördination are recorded as follows: There were no sex differences in the scores on either test. The scores at six years nearly doubled those made by the three-year-old children. Movements with the left hand were more difficult than movements with the right hand, and the differences with the 2 hands became greater as age increased. Children who made more accurate movements with the right hand, than others in the group, also made more accurate movements with the left hand.

As early as 1892 Bryan (1) invented a very complicated tracing-board which he used to considerable extent. Among the conclusions he reached was that the maximal rate of move-

ment probably furnishes a test of the general condition of the central nervous system, of the nerve centers by which the muscles involved in the movement are controlled. He estimated that the rate of the child of six years was two thirds the rate of the youth of sixteen. Girls excell boys at thirteen years but are inferior at all other ages.

PROBLEM, TESTS, AND SELECTION OF SUBJECTS

During the teaching and supervising of art in schools in California some years ago, I found, especially in the low elementary grades, little difficulty in interesting both Italian and Mexican children in the subject of clay modeling and other hand work, such as basketry. Moreover Mexican children seemed unusually deft in handling clay and frequently turned out much more interesting results than did American children.

Later, in giving Binet tests to mixed groups, I found that the California Spanish, Mexican, and Italian children seldom failed on such tests as the tying of a bow, and the discrimination of weights, while the American children often failed to score a plus on those tests. Whether these differences are chance, environmental or real differences in ability is a problem upon which little conclusive experimental work has been done.

The purpose of this investigation is to study the results of certain manual processes given to groups of American and Latin children with the hope that it may throw some light upon the question as to whether there are racial differences in bi-manual ability or

whether it is a traditional attitude with some persons to expect Italian and Mexican children to be more gifted manually than American children.

Selection of tests

The tests in this study do not in any way represent a scale of performance tests, such as the Pintner-Paterson scale. Although the 11 tests used do not all require the actual use of both the right and left hand, the tests have been so arranged that the activity or passivity of the left hand was always observed and noted. The chief thought was to choose tests that would be simple and thus avoid discouraging young children, ranging from four years, nine months to seven years, nine months. Another consideration was to find tests that would contain somewhat familiar processes and would be attractive; and it was necessary to make a selection that would require only the simplest directions in order to be certain that the foreign children understood the requirements; moreover the desirability of arranging a group that could easily be completed in one hour or less to avoid fatigue and its consequent inertia and loss of interest was paramount.

As it seemed desirable to have some definite method of getting at the mental status of the subject, and as it would have consumed too much time to give each one a Binet test, two tests were finally decided upon: one was the Goodenough (3) test of "The Measurement of Intelligence by Drawings," the other was a set of picture puzzles based upon Rosso-limo's "profile method," which ac-

cording to Johnson (6), Rossolimo designated as a test in the "capacity to combine."

Age and race groups

The ages of five, six, and seven were chosen because it was desirable to select children who had been given little instruction in manual processes. Those ages could be easily obtained in the public schools. The average ages were as follows: Baltimore Americans, 6 years 6.6 months; San Diego Americans, 5 years 7.5 months; Sicilians, 7 years 1.1 months; Mexicans, 6 years 2.8 months.

Social status

The Italian children studied were all Sicilians, found in a city school of Baltimore which was entirely made up of Sicilians. The neighborhood was dirty and ill-kept. The school also was in harmony with the district, with its small, dusty, windswept yard: but it had a corps of enthusiastic teachers; women who were studying their district conditions and endeavoring to better them. The school nurse had gained the confidence of these suspicious and superstitious people, and was doing excellent work with mothers in inducing them to allow corrective and preventive work to be done. Nearly all the children were wearing various amulets around their necks, and one child was wearing the same dress for a year, without having it washed, because the grandmother had promised that she would, if her younger sister lived through a severe illness. The children looked undernourished, many with obvious physical defects. This group was by far the lowest type

group studied, and could not compare even with the poorest of the Mexican or San Diego American group.

The determination of what constituted an American child was based upon the fact that the parents, and, as far as I was able to determine, the grandparents were born in America. A group of 52 American children in one of the most exclusive residential districts of Baltimore was tested. Their school was new, beautifully equipped with every modern convenience to do an advanced type of school work. The children in the kindergarten changed to tennis-shoes on coming in doors, and all were taught to tie their own shoe-strings, so their score on this bow-knot test was high. Because of the very different social status and environment of this group in comparison with the Sicilians and Mexicans, I have used another American group, whose school and home conditions were more nearly comparable for correlations with the foreign groups.

The other group of American children was selected from the same school that the Mexicans came from, and were children living in the same neighborhood as the Mexicans, and in comparable limitations of income and housing. The average age of this American group was 5 years 7.5 months, while the average age of the Baltimore group was 6 years 6.2 months. In none of these studies did I find any group living in the squalor and poor housing that I found the Sicilians living in. Not that such conditions for other nationalities possibly could not be found, but, living for the Mexicans, for instance, in Southern

California does not offer the problem of over-crowded cities and lack of space and the closing of houses to fresh air in winter, that such a city as Baltimore offers. However, Goode-nough (2), in comparing the living conditions of Chinese and Japanese in California with Italians, states that social pressure of "race prejudice" is often urged as a reason for the segregation of certain racial groups within poorer neighborhoods; but that

"it should be remembered that while racial prejudice may bring about segregation, the character of the neighborhoods thus set off is primarily dependent upon the people living in them. It is doubtful whether even the southern Negro has more to contend with in the way of this prejudice than the Chinese or Japanese in California; yet the contrast between the typical Oriental neighborhood and the Italian (or Negro) district is marked. Poverty there may be, but the squalor which is characteristic of the Italian (and the Negro) sections is lacking."

The Mexican children were all the first generation born in the United States. The group of Mexicans represented in this study was tested in one of the San Diego Public Schools, located in a Mexican district, while a few were taken from kindergartens in Santa Barbara. In each class, however, the entire group of five, six, and seven year old children was examined. The San Diego school building was very much like the one in Baltimore where the Sicilians were housed, but it was augmented by many bungalows in the school yard. In these were held the lower primary and kindergarten classes. The yard was inadequate in size and equipment, but because of the mild climate, all the

physical exercises were done out of doors, as well as many class recitations and activities.

The numbers in the groups tested are nearly equal: Sicilians 55, Mexicans 53, San Diego Americans 50, and Baltimore Americans 52. The sexes are unequally divided, for it seemed a less selective method to take all the children of the three age-groups in the classes, than to take the same number of girls as boys. So the groups run: Sicilian boys 24, girls 31; Mexican boys 18, girls 35; San Diego American boys 22, girls 28; Baltimore American boys 26, girls 26.

ORDER OF TESTS

Careful consideration was given to the order of presenting the tests; since the series took an hour to give, fatigue and loss of interest had to be avoided.

The following order was finally decided upon as it seemed to offer the maximum of variety in those to be performed while standing and those performed sitting:

Peg board.....	standing
Drawing of man.....	sitting
Tying of bow.....	sitting
Goddard formboard.....	standing
Nut and bolt.....	sitting
Buttoning of belt in back....	standing
Peg board in colors.....	standing
Threading of needles.....	sitting
Motor coördination.....	sitting
Picture puzzles.....	sitting
Stringing buttons.....	sitting

DRAWING OF A MAN

For the Goodenough Drawing test the child was given a 9 by 12 inch sheet of drawing paper and a large soft pencil; the directions were as follows: "On this paper I want you to

TABLE 1

I.Q. score in the test of the drawing of a man

	C.A.	M.A.	I.Q.
<i>Mexican</i>			
<i>Boys</i>			
1	5-3	6-3	119
2	5-4	6-6	122
3	5-4	5-0	99
4	5-4	5-6	103
5	5-7	4-9	85
6	5-11	8-3	140
7	6-0	6-9	102
8	6-0	7-3	121
9	6-1	7-9	127
10	6-1	6-9	111
11	6-5	6-3	97
12	6-6	5-6	92
13	6-7	5-9	88
14	6-7	10-0	147
15	6-8	6-9	101
16	7-0	7-0	100
17	7-0	9-6	135
18	7-1	7-6	105
<i>Girls</i>			
1	4-9	6-0	126
2	4-10	5-3	108
3	5-0	6-0	120
4	5-0	5-9	115
5	5-0	5-3	105
6	5-0	6-0	120
7	5-0	6-3	125
8	5-2	6-0	116
9	5-3	6-9	128
10	5-3	5-9	109
11	5-4	6-9	126
12	5-5	7-3	134
13	5-7	5-3	94
14	5-8	7-0	123
15	5-8	7-6	133
16	5-9	7-3	126
17	5-9	5-3	91
18	5-11	6-9	114
19	5-11	6-0	101
20	5-11	7-6	127
21	5-11	6-9	114
22	5-11	5-0	85
23	6-0	6-6	108
24	6-0	6-6	108

	C.A.	M.A.	I.Q.
<i>Mexican—Concluded</i>			
<i>Girls—Concluded</i>			
25	6-1	7-3	119
26	6-2	5-3	85
27	6-4	10-9	170
28	6-7	7-3	111
29	6-7	7-0	106
30	6-7	6-0	92
31	6-9	9-6	140
32	6-11	5-3	76
33	7-0	6-6	93
34	7-5	6-6	87
35	7-6	7-0	93
<i>Sicilian</i>			
<i>Boys</i>			
1	4-10	6-0	123
2	5-5	7-0	128
3	5-9	6-6	112
4	6-1	8-9	143
5	6-5	5-0	73
6	6-5	5-3	82
7	6-5	6-3	97
8	6-5	7-9	120
9	6-7	5-0	76
10	6-7	6-3	95
11	6-7	6-9	102
12	6-7	5-6	84
13	6-7	7-3	110
14	6-7	5-9	87
15	6-10	7-6	110
16	7-0	5-9	82
17	7-0	5-9	82
18	7-1	5-6	78
19	7-1	5-3	74
20	7-2	7-3	101
21	7-2	9-0	125
22	7-3	6-6	89
23	7-3	8-6	116
24	7-3	6-6	90
<i>Girls</i>			
1	4-6	5-0	111
2	5-3	5-6	105
3	5-7	7-0	125
4	5-8	7-0	123
5	5-9	5-9	100

TABLE 1—Continued

	C.A.	M.A.	I.Q.
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*Sicilian—Concluded**Girls—Concluded*

6	5-9	6-6	113
7	5-9	7-9	135
8	5-9	6-0	104
9	5-10	6-0	103
10	5-10	6-3	107
11	5-10	5-9	98
12	6-3	6-9	107
13	6-3	7-6	120
14	6-4	6-6	102
15	6-4	7-0	110
16	6-5	10-0	155
17	6-7	6-0	89
18	6-7	6-6	99
19	6-9	5-3	78
20	6-10	6-9	98
21	7-0	7-0	100
22	7-0	7-3	104
23	6-7	6-0	92
24	6-8	5-9	86
25	7-0	6-0	86
26	7-1	6-9	95
27	7-1	5-6	78
28	7-3	6-6	89
29	7-4	9-0	122
30	7-4	7-6	102
31	6-8	6-3	94

*San Diego American**Boys*

1	4-11	6-3	126
2	5-0	5-0	100
3	5-2	4-6	87
4	5-4	5-4	100
5	5-4	5-3	98
6	5-4	5-9	107
7	5-4	5-0	93
8	5-4	5-9	107
9	5-7	5-3	94
10	5-8	4-9	84
11	5-9	4-9	83
12	5-11	6-6	110
13	5-10	6-6	103
14	6-0	6-9	102
15	6-1	6-9	111
16	6-5	5-9	90

	C.A.	M.A.	I.Q.
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*San Diego American—Concluded**Boys—Concluded*

17	6-7	7-0	106
18	6-7	6-6	99
19	6-9	6-6	96
20	6-9	7-0	103
21	6-10	4-9	70
22	7-1	6-6	93

Girls

1	4-6	5-6	122
2	4-7	6-0	130
3	4-10	4-3	87
4	5-0	5-3	105
5	5-0	6-3	125
6	5-2	4-6	87
7	5-2	5-3	101
8	5-3	6-3	119
9	5-3	6-0	114
10	5-4	5-9	107
11	5-5	6-6	120
12	5-6	5-6	100
13	5-6	7-3	133
14	5-7	7-6	135
15	5-8	5-0	88
16	5-9	5-6	96
17	5-9	6-9	117
18	5-9	4-6	79
19	5-11	5-6	93
20	6-0	7-3	121
21	6-0	4-6	75
22	6-0	6-9	112
23	6-2	5-6	90
24	6-2	5-3	85
25	6-4	7-0	110
26	6-8	6-9	101
27	6-9	6-6	96
28	7-1	5-6	78

*Baltimore American**Boys*

1	5-5	3-9	69
2	5-5	5-9	106
3	5-7	5-6	98
4	5-7	7-0	125
5	5-7	8-0	143
6	5-9	6-6	112

TABLE 1—*Concluded*

	C.A.	M.A.	I.Q.
<i>Baltimore American—Concluded</i>			
<i>Boys—Concluded</i>			
7	5-9	6-9	117
8	5-11	7-9	131
9	6-0	7-3	125
10	6-2	6-0	97
11	6-3	7-0	112
12	6-3	6-3	100
13	6-4	6-0	95
14	6-5	5-9	89
15	6-8	6-0	90
16	6-9	4-0	60
17	6-9	6-6	96
18	6-9	6-6	96
19	6-9	5-6	81
20	6-9	6-9	100
21	6-10	6-3	91
22	6-11	6-9	97
23	7-1	5-6	78
24	7-3	6-0	83
25	7-3	8-0	110
26	7-5	6-9	91

Girls

1	5-1	5-3	102
2	5-3	7-9	147
3	5-4	6-0	113
4	5-5	5-3	97
5	5-7	7-0	125
6	5-7	6-0	108
7	5-8	8-0	135
8	5-10	6-6	111
9	5-11	10-6	176
10	6-0	6-3	104
11	6-0	7-9	128
12	6-0	6-0	100
13	6-3	6-6	104
14	6-7	6-9	102
15	6-8	6-0	90
16	6-9	6-0	89
17	6-9	6-0	89
18	6-10	7-0	103
19	7-0	6-6	93
20	7-1	6-6	92
21	7-2	8-3	142
22	7-4	6-6	88
23	7-7	7-6	98
24	7-8	9-0	117
25	7-9	11-0	142
26	7-2	8-3	115

make a picture of a man. Make the very best picture that you can. Take your time and work carefully."

Some of the children had to be encouraged to make a start but not a child refused to make the drawing. Many of the American children chatted all the time they were drawing, naming each part as they put it in. This chatting was not so voluble with the foreign children, although they commented on an item now and then.

Over 77 per cent of the total test of the Drawing of a Man by the 53 Mexican children gave a higher mental age than the chronological age of the child; 58 per cent of the Sicilians, 56 per cent of the San Diego Americans and 60 per cent of the Baltimore American group.

The drawings made by the Sicilian group were unlike those of the other groups in that they contained much more anatomical detail. Very often a circle or ellipse across the middle of the trunk was "the belly." The navel was often represented. These drawings were, on the whole more dramatic than those of the other groups. The man would be running, or raking, or smoking, or even shooting. One man had a large pistol in his pocket. The fact that they were drawing "a man" was evidently seldom remembered by any of the children, for when they clothed him, he was just as liable to be wearing a dress as coat and pants. The incongruities seemed to be unrecognized by most of the children: the fact that the man was wearing nothing but a tie or hat with no other clothing received no consideration.

It is a notable fact that the difference in social status and type of environment of these groups is clearly shown by the comparison of the drawings of

the Sicilian group, who came from very poor and ignorant homes, with the drawings of the American group studied in Baltimore. In the latter group more clothing is shown, and such things as golf-sticks and canes and umbrellas were depicted. One drawing is of a "Pilgrim." In not one is the stomach drawn nor the navel. In the drawings of the Sicilian children fewer show clothing, and when the man carries something, it is usually a gun. One child, when he was finishing, put a vertical and horizontal line across the trunk; when asked what it was he said, "The cross of Jesus." Another child, after finishing the drawing of the man, drew a series of vertical lines in the space to one side. I asked what that was, and he said, "Macaroni for the man to eat."

One Mexican child drew a man with six fingers, a line out from each finger and a circle on the end, this was a "balloon man." Such comments as "he's running," "he's shooting a gun," would come from the foreign children, but the American children often told a whole story about their drawings as they progressed. Only a few children, in any of the groups, drew profile; almost all were front view. In a few cases the children drew the man upside-down through-out the entire test, but in all cases, when they had finished they turned the drawing around to the correct position. Quite a number began with the legs instead of the head.

In over two hundred drawings only one could be said to show what Good-nough (3) terms "flight of ideas." The arms and hands were like feather dusters and were huge as compared

with the size of the rest of the figure. The feet were like lily-pads with lines like the veins of the leaves, running out from where the legs form the feet. The head was mostly hair. This child was five years, four months old, and was considered a great problem in school. She showed little ability to give attention and was erratic and unable to follow directions. The mother was much troubled about her, but the mother also showed a high degree of nervous tension, was very anxious and extremely talkative.

The only other drawing that was unusual was done by a boy of five years, five months. This consisted of an oblong with 2 circular scribbles in the right half, joined to another small oblong. When asked what these were, he said, "Eyes, mouth, nose, big feet." The "big feet" were the sides of the smaller oblong. This drawing does not come into the class showing indications of psychopathy, however, but simply shows unusual immaturity. He was a tiny, very babyish child in looks and in speech and made a mental age by the drawing test of three years, nine months. Both these children were in the socially highest-type group.

Left hand

After the drawing of a man was completed with the right hand (only 3 preferred the left hand) then the picture of a man was drawn with the left hand. Many of the children did not hesitate, but put the pencil into the left hand and started drawing at once, but others said "I can't;" one child said, "I'll make a funny man." For many of the children the change



FIG. 1

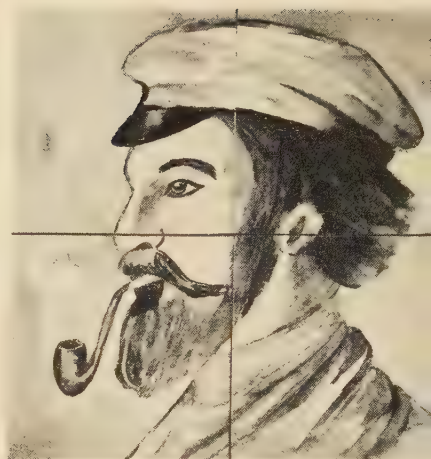


FIG. 4



FIG. 2



FIG. 5



FIG. 3

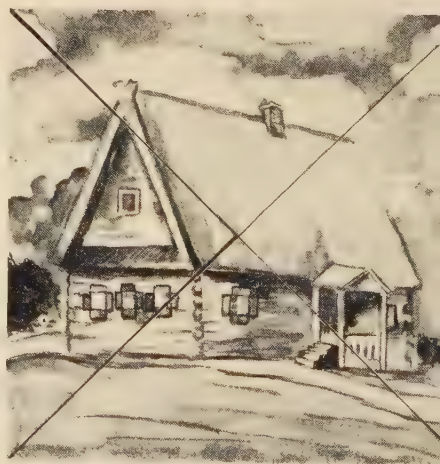


FIG. 6



FIG. 7



FIG. 9



FIG. 8



FIG. 10

was so awkward that they had to make a great effort to do it. One child put his tongue in his cheek, several "chewed their tongues." There were a number of children who appeared to use the left hand as easily as the right. They showed fairly good motor-control; the lines were firm and the joining of lines good.

In most of the cases where the use of the left hand seemed so difficult, the right hand would go over to the left again and again to help, especially when it came to the drawing of the features and other details. Without seeming to realize it, the child frequently changed the pencil back to the right hand. For the most part, those who found the left hand drawing difficult would hold the pencil with fingers far back from the point, or would hold it with a fist-like grip and press down hard upon the paper.

There were children who appeared to be ambidextrous and who seemed to enjoy using the left hand. One of these children, when making the first drawing, would use the right hand to work on the right side and would change the pencil to his left hand when drawing the details of the opposite side of the picture. In most cases the use of the pencil for drawing with the left hand was difficult. The position of the hand in holding the pencil was awkward and the motor-control much poorer than when the right hand was used. The opposite was true for two of the children who were left-handed.

PICTURE PUZZLES

The picture puzzle test was placed as the eleventh in the last of perform-

ance tests, but since it was based upon the Rossolimo test that was designed to measure mental capacity the discussion of it is given here in order to compare it with the standardized test of Goodenough (3). This test has not been standardized, nor are there norms for the Rossolimo.

This test consists of a graded series of 10 pictures 6 by 6 inches done in water-color, mounted on fourply veneer, shellaced and cut. The subjects are similar to the Rossolimo series but substitutions have been made for the 5 familiar objects that seemed to the writer to be more attractive to young children than Rossolimo's, and the 5 geometric figures that are black on a white ground in the Rossolimo, have been changed to color. The circle is red; the square, orange; the oval, purple; the snake-like design, two tones of green; and the star, two tones of blue. As the Rossolimo series is copied in water-color and the white water-color paper soils so quickly the substitute set is protected by shellac. Otherwise one set of dissected pictures might not have lasted through the experiment. This process has somewhat changed the character of the color, yellowing the whites, and mellowing the brilliancy of the colors. It is just possible that had picture varnish been used there would have been a little less change in the color. The 10 pictures are cut in the same shapes as those of the Rossolimo series.

The five that have been changed as to subject are shown in the accompanying photographs. For the geometric figures see Johnson (7).

One reason for putting this series toward the end of the gamut of tests

was the thought that the performance took a much longer time than any other single test and that it might be discouraging if given toward the beginning. Then, too, the child tested would be better acquainted with the examiner and more at ease, and so would be likely to make a better pro-

was kept with a stop-watch; 3 minutes being the limit of time allowed for each picture.

The method of procedure, was similar to Johnson's in stopping the test after 2 successive failures were made. In a few cases she allowed the child to try other pictures after 2 failures, but

TABLE 2

Scatter of failures in picture puzzle test

PUZZLE NUMBER	5 YEARS				6 YEARS				7 YEARS				TOTALS			
	Mexicans	Sicilians	San Diego Americans	Baltimore Americans	Mexicans	Sicilians	San Diego Americans	Baltimore Americans	Mexicans	Sicilians	San Diego Americans	Baltimore Americans	Mexicans	Sicilians	San Diego Americans	Baltimore Americans
Number of children																
21	11	28	14	25	25	19	23	7	19	3	15					
1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	1	0	1	3	0	1	0	3	0	0	0	0	1	1	1	6
4	1	2	2	5	2	2	0	2	0	1	1	0	3	5	3	7
5	4	5	12	6	0	7	0	5	0	9	0	2	4	21	12	13
6	1	1	4	4	3	4	2	5	0	1	0	0	4	6	6	9
7	10	8	17	9	8	19	0	12	0	8	0	5	18	35	17	26
8	8	5	18	12	7	19	8	16	1	11	2	7	16	35	28	35
9	21	11	28	13	23	22	19	23	7	19	3	13	51	52	50	49
10	20	9	27	14	17	23	16	22	5	18	3	13	42	50	46	49
Total...	66	42	109	66	60	97	35	88	13	67	9	40	139	206	163	194

longed response. Experience with these 212 children makes me conclude that this was probably a wise decision.

Procedure

The pieces of the pictures were placed in the same order for presentation as that given by Johnson (6) but the instructions were slightly changed, and were as follows: "This is a picture that has been cut into several pieces, see if you can put it together again to make a picture." The time record

she states that in no case was the attempt successful.

With the series of pictures substituted in this experiment for those of the Rossolimo series, all the children were allowed to try all of the pictures, stopping the trial at the three-minute time-limit for each picture. The findings differed from Johnson's in the matter of successful scores after 2 successive failures, which leads to the question as to whether the series used in this study is as well graded as the

Rossolimo series. With this possibility, or perhaps probability, in mind, the method of scoring was changed. Instead of considering the score to be the "number designating the place in the series of the final picture which is correctly solved," (after 2 successive failures), the aggregate of all the correctly solved pictures was used as

In table 3 showing the distribution of scores, the Mexican group is far in advance of all the other groups in the number of high scores, the aggregate being 8 for score 9, and 1 for score 10. Neither the San Diego American group nor the Sicilian group had a score of 10; the Baltimore American group shows one such score.

TABLE 3
Distribution of picture puzzle scores

SCORE	5 YEARS				6 YEARS				7 YEARS			
	Mexicans	Sicilians	San Diego Americans	Baltimore Americans	Mexicans	Sicilians	San Diego Americans	Baltimore Americans	Mexicans	Sicilians	San Diego Americans	Baltimore Americans
0												
1												
2								1				
3	1			3				2				
4	2	3	4	2		4	1	3		1		
5	3	4	5	2		4		3		1		
6	2		10	4	1	10	3	7		5		4
7	9	3	9	3	6	5	3	3	1	7	2	2
8	11	3	4	3	6		7	6	2	3		5
9	1	1			4	1	2	1	3			
10					1							1
Total....	29	14	32	17	18	24	16	23	6	17	2	12
Average..	6.7	6.0	6.1	5.7	7.8	5.8	7.9	6.8	8.3	6.5	7.0	7.3

the score. This lowers the score in some cases where the final result showed much scattering.

The scores given in table 2 show the extent of scattering. Although the burden of failures is found on puzzles 9 and 10, yet it also shows that quite a number of individuals succeeded with picture 10 who failed with 9. As picture 9 is one of the substitutions for the Rossolimo pictures, it may be that the one used in this study presents more difficulties than number 9 of the Rossolimo series.

It was notable throughout this test that during the first of the series, where the picture was relatively simple for most of the children the stimulus-pattern was the picture represented, but as the picture became more complicated, they began to work to fit shape rather than design.

In the case of the Mexican boy who had a score of 10, picture-design was his motive throughout. In puzzle 9, he said, "This is a house and it's near the water." In the star he systematically put the corner squares to-

gether, making the design match; then he put the four squares together, clearly showing that the picture pattern was what he was working for. One little girl who also worked for design throughout said, "The sky is at the bottom of the picture, too;" referring to the reflection of the sunset in the water. Many of the children in doing the star-puzzle seemed to work for pattern, but were satisfied with a very irregular picture-pattern result. Some of the younger children showed the tendency that Johnson (6) reports: In putting the third picture together, they would put the pieces in a row and say "Baby;" or perhaps they got three pieces together correctly, then put the fourth in in whatever way it happened to lie on the table, and were satisfied with the result.

When the San Diego groups were examined it was near Easter, and many of the children at once said, "It's an Easter egg" when they correctly solved the puzzle with the oval pattern. The majority of the children named the pattern as soon as they had the pieces put together correctly. The red circle was usually called "a red apple." Twice the orange square was called a "handkerchief" by girls. Some of the children would get pieces together correctly, not recognize the fact and pull them apart again. This was especially true of the snake-like pattern. One little girl who failed on this test said, "That is a hard one, looks like a round snake." One child said of the oval, incorrectly assembled, "It's a water-bottle." One boy who had a score of 4, never did seem to get the real idea of assembling for a pattern. He shoved the pieces around

with no apparent idea of what he was working for. This was a San Diego American boy. It was surprising at times how satisfied a child would be with a perfectly incongruous and irregular grouping. One unsuccessful little girl of the Baltimore American group said, "Gosh, I think this is fun!" There were some who, after the first one, used a "trial and error" method throughout the test. One of the Sicilian group made a score of 9, using this method.

PLAIN PEG BOARD

The first test given was a peg board. This board is of varnished maple, with pegs to match. The size is 12 by 12 inches with 36 half-inch holes, 6 on a side, equidistant, leaving a margin of $1\frac{1}{2}$ inches. The pegs are 3 inches long and $\frac{7}{16}$ inches in diameter, with the edges of both ends beveled to prevent the peg from chipping and from being difficult to slip into the hole.

The pegs were in a shallow pan at the right of the board (at the left, if the child were left-handed). The table was low, so the child looked down upon the board as he stood in front of it.

The directions were: "Put your left hand (indicating it) on the lower corner of the board, and with the other hand put all these pegs in these holes just as fast as you can, picking up only one peg at a time. Ready, go!" The time was kept with a stop-watch.

Most of the children began to put in rows of pegs beginning at the right side, and either put the pegs in rows from front to back or from back to front; but some worked forward and back all the way across the board in-

stead of starting each new row at the front. Few of them had the idea of starting at the left side and so avoid reaching over those pegs that were already placed. Almost every combination of method was employed; however, the most frequent was in rows from front to back or the reverse, with the exception of the San Diego groups. There were only 2 children who used a hit or miss manner.

The San Diego children, almost without exception, put in all the outer

being 59 seconds. This was made by a little girl of seven years, four months who made a record of ten years, three months on the Drawing of a Man and a score of nine on the Picture Puzzles. However, on the finer coördinations, such as the threading of needles, she was very slow, taking 4 minutes and 30 seconds to thread the six needles. She was left-handed.

All the children who were left-handed were allowed to use that hand. The poorest record was made by a boy

TABLE 4
Average time for peg-board

	BOYS		GIRLS	
	<i>minutes</i>	<i>seconds</i>	<i>minutes</i>	<i>seconds</i>
Mexicans:				
Plain.....	1	28	1	26
Colored.....	1	28	1	30
Sicilians:				
Plain.....	1	23	1	25
Colored.....	1	32	1	32
San Diego Americans:				
Plain.....	1	26	1	25
Colored.....	1	35	1	32
Baltimore Americans:				
Plain.....	1	26	1	26
Colored.....	1	30	1	28

rows of pegs first, then filled in the center either in concentric squares or in rows across. This was the only group of children who used this method; a very few individuals had done so. In talking with the teachers of this group one kindergartener said that in their use of the peg board they generally told the children to put a fence all around the board first.

The averages for all the groups were very close as is shown in table 4.

Both the best and the poorest records appear in the Baltimore group of American children, the best record

five years, five months who took 2 minutes 50 seconds for the test. His rating for the Drawing of a Man gave him a mental age of three years, nine months and his score in the Picture Puzzles was three. His procedure was unlike that of the other children in that several times he picked up a whole handful of pegs, and was sufficiently distractable to leave the board at one time to ask if we were going "to play a game with those," pointing to other apparatus. He was a tiny, undeveloped child, very babyish in his manner.

In the other 3 groups the highest as

well as the lowest records are found in the Mexican group. There were 3 children in this group who took over 2 minutes for this test, the longest record being 2 minutes and 26 seconds. The shortest record was one minute.

There was one child who was so steady in putting the pegs in that her reactions were almost rhythmic. It was difficult, with some of the five year old children to give them an idea of speed. One child of four years,

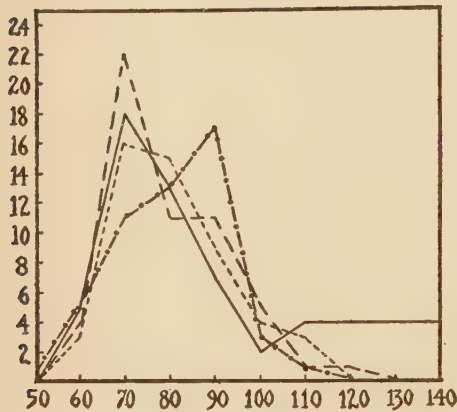


FIG. 1. RELATIVE TIME SCORES. PLAIN PEG BOARD

— Mexican; — Italian; - - - S. D. American; —●— Baltimore American.

seven months stopped to blow her nose, another started to tell me about her baby brother, and held a peg up until she was reminded to hurry. Some of the children were prone to pick up 2 pegs at a time until reminded not to do so. One child did this every time he thought I was not looking. In 2 cases the children had to be urged to "go on," as they appeared to think that after one row was in, the test was finished. One child even started to take the pegs out.

Left hand

All the children who were left-handed were allowed to use that hand instead of the right hand in these tests, in which case the apparatus was arranged with the same relation to the left side of the child as for the right side of those who were right-handed. There were 3 left-handed children, 2 Mexicans and 1 Baltimore American. One of the former appeared to be ambidextrous, especially when using a pencil. At first, when told to "put the left hand on the corner of the board," some of the children would press the left hand down hard until they became interested enough to forget and relax.

COLORED PEG BOARD

Although the Colored Peg Board test is number seven in the list of tests as given, the results of that test will be given here in order to compare them with the results obtained with the Plain Peg Board.

This board is constructed like the other peg board with the exception that it is painted in three stripes of color, one blue, one deep yellow, and one green. Each stripe covers twelve peg-holes, and the twelve pegs belonging in these holes are painted the same color as the stripe.

The directions were:

"Here is another peg board, just like the first one, but in 3 colors, with pegs to match: the blue pegs go into the blue stripe, (illustrate by putting in a blue peg); the yellow in the yellow stripe (illustrate); and the green pegs in the green stripe (illustrate). Put your left hand on the corner of the board and pick up only one peg at a time. Let me see how fast you can put these pegs in the holes where they belong. Ready, go!"

Most of the children greeted the second peg board test with seeming pleasure, and some would have started to put the pegs in before the directions were completed if they had been permitted.

The board was so placed with reference to the child that the blue stripe came to the right, the orange in the center, and the green to the left. The stripes ran at right angles to the front

best time did not look back at the pan of pegs each time, but picked up a peg without looking. In the case of the colors, the peg had to be selected each time, and, when it came to the last two or three of a color, the child would perhaps have to hunt for them. The pan in which the pegs were kept was large enough for all the pegs to lie flat without covering each other if they had been placed in order, but this was not the procedure.

In over two hundred children tested, not a single child appeared to be color-blind, at least as far as these 3 colors (blue, yellow, green) were concerned. If by chance a child put a peg in the wrong stripe he either changed it immediately or when he found a peg left over of the color he was filling. One child discovered that she had put a blue peg in the green space and said "Do you know why I got the blue one in there? Because my eyes are bad."

The majority of the children selected one color and filled all openings there first, then took another color. But in this, as in the plain peg board test, every variety of procedure was used. One child put one row of each color in first; then filled in the second rows in the same order. Some began with the blue and put in rows front to back and back to front uniformly all the way across, ending with the green pegs. Only one child put into the appropriate stripe whatever peg he happened to pick up without looking. About half of the children filled in the green stripe first, though some of them filled the blue second and yellow last.

There were still quite a number who found it difficult to refrain from picking up more than one peg at a time.

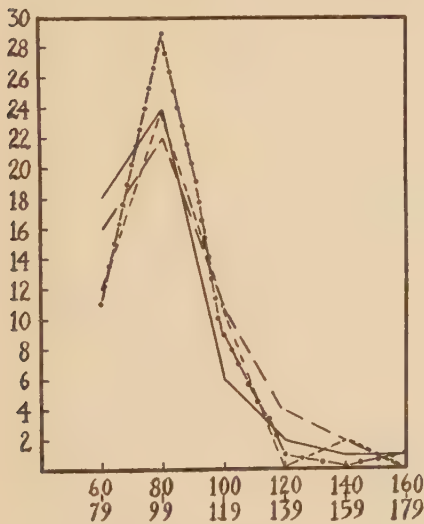


FIG. 2. RELATIVE TIME SCORES. COLORED PEG BOARD

— Mexican; — Italian; — — S. D. American; —●— Baltimore American.

edge of the table. The pan of pegs was placed at the right of the board unless the child were left-handed, then both pan and board were reversed.

The pegs were thoroughly mixed in the pan so the colors had to be picked out. This may have been a reason why the test took a longer time than the plain peg board, for in the latter test the children who made the

The control of the left hand, as far as its reaching over to help the right hand was concerned, was much improved in this test, though it showed much the same activity or relaxation that it showed in the first peg board test.

The average time in performing this Colored Peg Board test was slightly higher than the time for the Plain Peg Board test. Table 4 shows these differences.

With some children the left hand would leave the corner of the board and be dramatically held out to the side with the fingers spread. Never was that particular manner of holding the left hand observed with the American children. This may have been chance but it seemed worth noting. In a number of cases of both American and foreign children the left hand left the board to grasp the dress tightly, or, in 2 cases to be held against the stomach or with the fingers spread apart. Sometimes the left hand was taken from the corner of the board and the edge of the table grasped. Some of the children held the index finger only on the corner of the board. In several cases the child started to take a handful of pegs in the left hand to feed the right hand. In many cases, more especially among the American children, the left hand would either be held in a relaxed position in the corner of the board or the child would drop it by his side. It was notable that the more tense positions were shown when the child appeared conscious of trying to go fast.

TYING A BOW-KNOT

In the Stanford Revision of the Binet-Simon tests, Terman places the

tying of a bow in the seventh year, but in this study it was used for all three ages represented. The procedure differed in 2 points from that given by Terman: first, the term "bow-knot," was changed to "bow" as the word *knot* confused the foreign children. The second point of difference was that the bow-knot was not tied around my finger, as with very young children where there is any shyness to be overcome, it has been my experience that one gets better results if the personal element is entirely eliminated, so a stick was substituted with the model on the same stick.

There is also a time element in the procedure of tying around the finger, the child may feel more hurried than when tying around a stick. The directions were "See, here is a bow; I want you to take this string and make the same kind of a bow on this stick." The criticism made by Terman that the stick often fell out of the string was not true of the test in this study. The stick was large enough (8 inches long and 1 inch wide) so the child kept it down on the table while he worked.

Table 5 shows the distribution. Of seven-year-old Mexicans none failed; of the 19 seven-year-old Sicilians 4 failed; of the 3 seven-year-old San Diego Americans 2 failed; and of the 15 seven-year-old Baltimore Americans 3 failed. The Mexicans show the lowest percentage of failures.

Considering the fact that the Baltimore American children were taught to tie their shoe-strings when they entered the kindergarten and the other 3 groups were not, it seems that the Baltimore Americans showed a high percentage of failures. There were several types of failure in this test;

some had no idea at all about any procedure to accomplish the task, others made the first loop, put the other string around it but when it came to pulling through the second loop they put it through the first loop instead of the wrapped around string. Others laid out 2 loops, 1 for each string-end, then picked up the loops and tied in a knot. This made a two-loop bow that would not pull loose easily but was not like the model.

failures in each group with the San Diego American group, (this is the group used in the correlations), the group making the least number of failures is the trained Baltimore American group. The Mexican percentages are lower for the six and seven-year-olds than the San Diego Americans, but higher in the six-year-old group but the aggregate of percentages is much lower for the Mexicans. The same data are found in the comparison

TABLE 5
Distribution of failures in tying a bow-knot

	5 YEARS				6 YEARS				7 YEARS				TOTALS			
	Mexicans	Sicilians	San Diego Americans	Baltimore Americans	Mexicans	Sicilians	San Diego Americans	Baltimore Americans	Mexicans	Sicilians	San Diego Americans	Baltimore Americans	Mexicans	Sicilians	San Diego Americans	Baltimore Americans
Number of boys.....	4	3	10	7	11	11	10	13	3	10	2	6	18	24	22	26
Number of girls.....	17	8	18	7	14	14	9	10	4	9	1	9	35	31	28	26
Boys—failures.....	2	2	8	2	0	8	4	2	0	2	2	1	2	12	14	5
Girls—failures.....	8	3	7	1	1	4	1	5	0	2	0	2	9	9	8	8
Totals.....	10	5	15	3	1	12	5	7	0	4	2	3	11	21	22	13
Percentage of failures.....	.47	.45	.53	.21	.40	.48	.26	.30	0	.21	.66	.20	.20	.38	.44	.25

When the children failed and were asked, "Don't you tie your own shoe-strings?" the child's invariable reply was "My mother does it." Johnson (6) states that "It was observed that the Italian children who failed almost universally in tying a bow-knot, wore button shoes and upon inquiry it was ascertained that these children rarely wore shoes with laces." In observing the groups used for this study, some of the failures were made by children wearing button shoes but by no means was this universally true.

In comparing the percentage of

of the Sicilian group with the San Diego American group, as for the Mexican and San Diego American. In comparing the Mexican and Sicilian groups, the five-year-olds of the Mexican group show a slightly higher percentage of failures, but the six-year-old group is lower and the seven-year-old group of Mexicans has no failures at all while the Sicilian group has .21 per cent of failures.

In the test of the tying of a bow the Mexican group rates higher than any but the Baltimore American group.

SEGUIN-GODDARD FORM-BOARD

The fourth test was the Seguin-Goddard Form-Board, which is too well known to require a description here; suffice it to say the standard form-board was used. The procedure with these young children was to place the 3 piles of forms to the right of the board and not at the back, because the latter presented some difficulties in reaching for the small children. The directions were: "See how fast you can put these blocks back in the holes where they belong. Ready, go!" The time was kept with a stop-watch. There were 3 trials on this test, the shortest time of the three was taken as the score.

The average time and median for each group was as follows:

The above average scores show that in this test the Mexican group made the shortest time of any of the groups; the longest time being scored by the Sicilian group.

Goddard form-board		
	AVER- AGE TIME	MEDIAN
	seconds	
Mexicans:		
Boys.....	29	} 28
Girls.....	29	
Sicilians:		
Boys.....	42	} 41
Girls.....	48	
San Diego Americans:		
Boys.....	31	} 31
Girls.....	36	
Baltimore Americans:		
Boys.....	40	} 40
Girls.....	45	

There was no difficulty in securing coöperation on 3 trials, for the children were sent to me "to play games," and

they took this repetition as part of the game. At the end of the first trial I said: "We do this 3 times to see if we can do it faster each time." In some cases the shortest time was made on the first trial, but in many of the cases on the second trial. At times it would seem, in observing the performance in this test, as if the last trial was going to prove much shorter, then perhaps the child would fumble in putting in the star or cross, or would

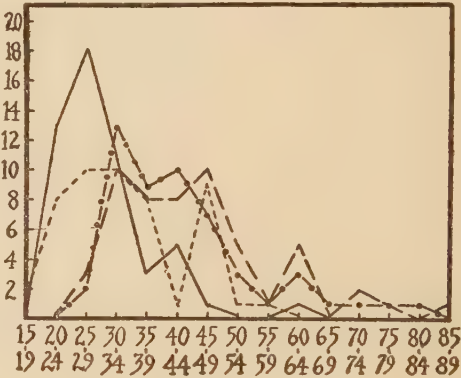


FIG. 3. RELATIVE TIME SCORES. GODDARD FORM BOARD

———— Mexican; ——— Italian; — — — S. D. American; —●—●— Baltimore American.

hesitate over the placing of some form that had gone in with no hesitation in the other 2 trials, and instead of making a shorter time, he would take longer for this trial than for either of the other two. There was one performance that occurred in a number of cases; the child would put the blocks in place in the first trial with practically no hesitation nor "hovering," but on the second trial would begin to hesitate and hold the block hoveringly above the board before

finding its place. Sometimes this response was even more pronounced in the third trial than in the second. Yet all the time such a child had the appearance of greater interest even than in the first trial.

Sometimes a child would drop a block on the board, or lay it to one side on the board, if he did not at once recognize the place for it. Then it would be placed when he recognized its proper place or would be left there to be put in place after all the others were in. Many of the children attempted to put the forms into the wrong places. Most of these mistakes occurred in forms of similar shapes; for example, the ellipse in the circle, or the diamond in the hexagonal space or vice-versa. There were some who tried to fit into the openings shapes that were dissimilar, such as the triangle in the circle and square in the diamond. A few started out with a trial and error method, giving no attention to the shapes but merely trying the blocks in the different openings until they found the right one. This method was not employed after the first trial in any of these cases.

The first performance was often very different from the other performances and offered a much more interesting study, as to the time element as well as the form perception and quality of attention shown.

Left hand

In this test the children were given no instructions concerning the use of the right or left hand, so in some cases the child used the left hand as much as the right hand, after the blocks were picked up by the right hand. In only

2 cases was it noted that the child reached to pick up the blocks with the left hand. The left hand was sometimes used to hold a block for which the proper place was not immediately recognized, and when the place for it was recognized this block would be put in with the left hand.

SCREWING NUTS ON BOLTS

The fifth test was screwing nuts on 6 bolts. The bolts were $4\frac{1}{2}$ inches long and $\frac{1}{2}$ inch in diameter with square head and square nut. They were threaded at one end $1\frac{1}{4}$ inches on the shaft. The nuts were $\frac{3}{4}$ of an inch square and $\frac{3}{8}$ of an inch thick and had been cleaned and slightly oiled when they were new, so the nuts would run on freely. The bolts were laid in a row, the head end toward the child; the nuts were in a row, one at the thread end of each bolt.

The directions were: "I want to see how fast you can put all these nuts on these bolts, running the nuts on as far as they will go, like this." I took up a bolt and, holding it in my left hand, started the nut and then ran it on as fast as possible with the fingers of my right hand, put it down quickly and started to pick up another without actually doing it. The children seemed anxious to do this test and, unless restrained would have started to carry out the directions before I put the bolt back. As soon as bolt and nut were in place, I said, "All right, ready, go!", starting the stopwatch as soon as bolt and nut were in the hands of the child.

There was one feature in this test affecting the amount of time the test took that was true in nearly every case.

If a right-handed child kept the bolt in his right hand and put the nut on with his left hand, almost without exception, the time for completing the task was longer, in some cases very much longer than when the nut was in the right hand and bolt in the left. In the first method the child was apt to experience great difficulty in getting the nut started, for he would screw it the wrong way and sometimes drop it off three and four times; sometimes it would drop to the floor. Some children would suddenly realize what the difficulty was and shift the bolt to the other hand. If they did not do this they were obliged to screw the nut toward them instead of away from them. Some children tried to run the bolt on against the palm of the left hand, but for the most part they laboriously turned the nut on little by little. Some of the children shifted the position of nut and bolt in the hands several times during the test.

A number of the children would hold the bolt upright on the table, balance the nut on top, then run it on with the right hand. The children employed a surprising number of different methods of procedure in performing this task. Some were very particular, in putting the assembled bolt and nut down, to lay it straight on the table and line the next ones up with it. Those who were quickest in the test were the ones who held the bolt in the left hand and ran the nut on either with the palm or fingers of the right hand, or very often with only the first finger of the right hand.

Twice one child changed the direction of the turning of the nut and nearly screwed off 2 nuts before he real-

ized the fact. Then, in changing from a method of slowly turning the nut on, the children would try to run it on in the palm of the hand and would turn the nut off instead of on. Some of the children chattered all the time until urged to hurry. A number of children who had difficulty getting the nut started would change the nut for another. One boy said, "Gosh, this one sticks, I guess it isn't the right one." It was observable that most of the children who had any difficulty in getting the nut started would show a reaction of the mouth, either it would be open, or the tongue would come out, or be twisted. Whenever there was difficulty starting, the children almost universally tried to force the nut on, some pushing as hard as possible with the nut quite crooked on the end of the bolt.

Very few of the children retained the idea of the necessity for speed; once in a while a child would appear to try to "go as fast as he could," but in only 2 cases was this attitude maintained throughout the performance. The comments of the boys on seeing the bolts were; "My father has some bolts like those." "We got some of these in our machine." "I can do that." "Gee! that's easy!" "I have these in my tricycle." The comments of the girls were of quite a different character; "None of the kids can do things as fast as me." "Hard to do, ain't they?" "Come on here, you old nut!"

The shortest time-score for this test was 44 seconds, made by a San Diego American girl; the longest time was taken by a Sicilian child who took 5 minutes 40 seconds for the test.

The average time for the test is as follows:

	AVER- AGE TIME	MEDIAN
	<i>seconds</i>	
Mexicans:		
Boys.....	107	} 112
Girls.....	141	
Sicilians:		
Boys.....	118	} 125
Girls.....	191	
Baltimore Americans:		
Boys.....	119	} 130
Girls.....	149	
San Diego Americans:		
Boys.....	166	} 120
Girls.....	157	

The only group in which the girls' average was lower than that of the boys was the San Diego American group. In this test the average for the Mexican boys was lower than the boys of any other group and the average of the Mexican girls lower than the girls of any other group.

BUTTONING A BELT IN THE BACK

This was the sixth test and offered a very interesting set of reactions for study. The belt was 2 inches wide and $34\frac{1}{2}$ inches long, made of plain blue calico, with a button $\frac{5}{8}$ of an inch in diameter sewed on one end with strong linen thread in such a way as to leave a shank of $\frac{1}{8}$ of an inch. A buttonhole was on the other end of the belt, $1\frac{3}{16}$ of an inch long, through which the button passed with ease. When a child was given this test the belt was adjusted to his waist size by taking a plait in the middle and pinning with a safety pin.

The directions were: "Hold this belt out in front of you like this (illustrating the button end in the left hand

and buttonhole in the right), and when I say, 'Ready, go!' I want you to put it around you and button it in the back as quickly as possible," (illustrating the action of putting it around the waist without buttoning). The belt was handed to the child with the button end in the left hand and buttonhole in the right, and the directions given.

Although, before starting the tests, the children had the explanation given them that nearly all the tests were timed "with this watch to see how fast you can do them," and in spite of the fact that this method of direction had been given for previous tests, 3 of the children, in taking this test, started to run across the room at the word "Go!" However, all the others followed the directions. If a boy had on a heavy sweater it was taken off; or if a little girl's dress were full and loose, a plait was pinned over in the front so that it would not get in the way.

Three trials were given and the shortest time-record for the three taken as the score.

The average time for each group was as follows:

	AVER- AGE TIME	MEDIAN
	<i>seconds</i>	
Mexicans:		
Boys.....	6	} 5
Girls.....	9	
Sicilians:		
Boys.....	7	} 7
Girls.....	7	
Baltimore Americans:		
Boys.....	8	} 7.5
Girls.....	7	
San Diego Americans:		
Boys.....	11	} 7
Girls.....	8	

The Mexican boys show the shortest time record, but in the aggregate of records for both boys and girls the Sicilians are the lowest and San Diego Americans, the highest.

Some of the children buttoned the belt easily in 2 seconds, but others took a long time. One Mexican child took a minute on one trial.

The action of the hands in this test was very interesting. The child who had the shortest time records put his first finger through the buttonhole and the button in thumb and finger of the left hand when he held the belt out in front. The time scores for the 3 attempts were many times very wide apart. Sometimes the poorest score would be the last attempt. Very often the shortest score was the first or middle score. When a child was having difficulty in getting the belt buttoned, he would often open his mouth, run out his tongue or shut his mouth tight or twist his leg or foot around, nearly losing his balance. Some grunted and said, "Gee, this is hard."

The Baltimore American group and the Mexican group had the longest and the shortest time-scores. The shortest time was 2 seconds.

THREADING NEEDLES

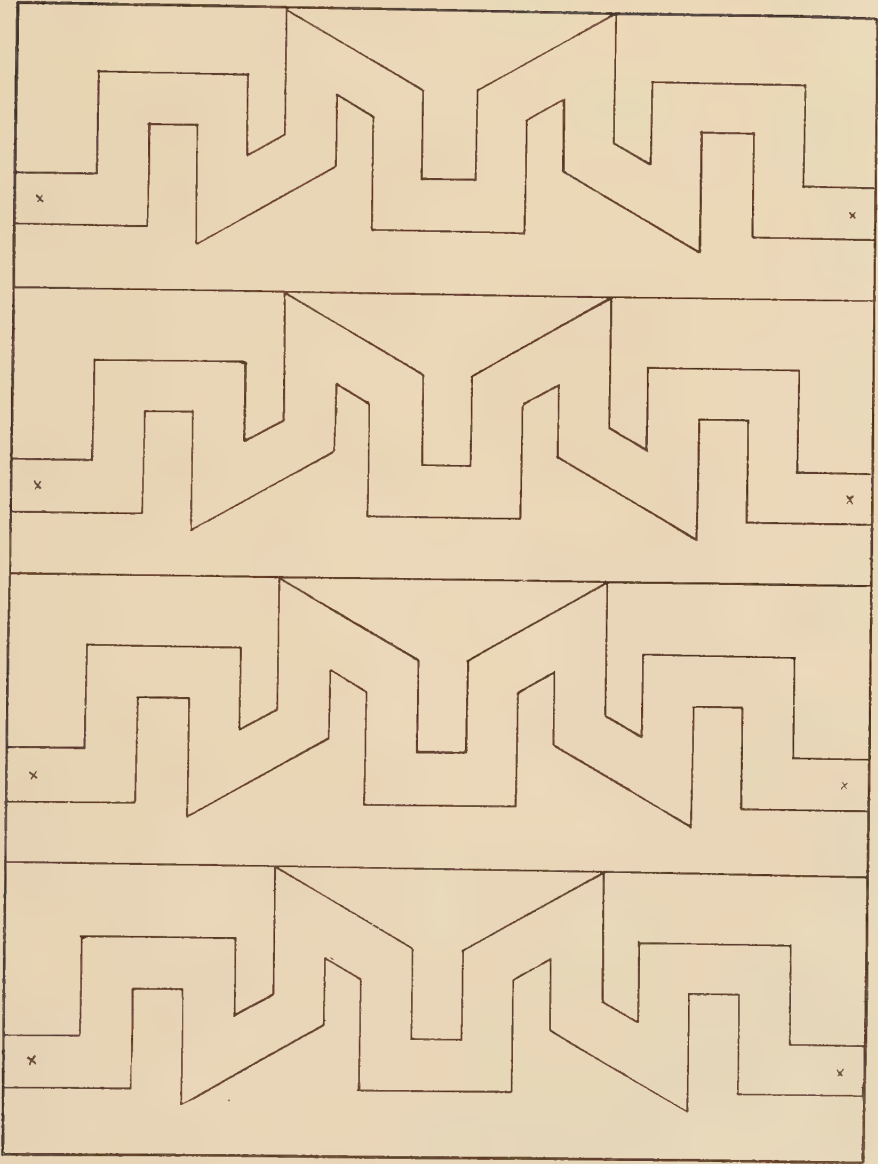
The only tests in this series of eleven, requiring fairly fine motor coördinations were the threading of needles and the drawing of lines within a certain path without touching the sides of the path.

Certainly both of these tests offer very interesting study material for steadiness of hand which might form a basis, in the writer's estimation, for the study of the neural condition of the

child, his general body-vigor, perhaps of his temperamental reactions also.

The 6 needles used in this test were the long-eyed needles used for wool embroidery and were number 1; the thread was linen, number 25. The threads were cut about 8 inches long and were waxed at both ends; they were re-waxed for each child and a new set of threads was cut each day, so each set was used by only 4 or 5 children.

The needles were stuck in a small cushion, and the thread laid in a row on the table in front of the child. The directions were: "Here are 6 needles and 6 threads; the threads are waxed at both ends, so they will go into the needles easily. If you spoil one end of the thread you can turn it around and use the other end. I want to see how quickly you can thread all these needles with these threads, like this." (I illustrated by threading a needle and dropping it on the table, then picked up another needle but did not thread it.) Replacing the needles and thread, I said, "Ready, go!" A stop-watch recorded the time. The length of time taken by the children in this test depended largely upon steadiness of hands, but one other element affecting the time-score was whether the needle was held in the left hand and the thread in the right or the reverse. When the needle was held in the right hand the scores show that the performance took a longer time in most instances. The left hand showed a greater amount of unsteadiness, and would sometimes give little jerks. The only exception to this observed condition was when the thread was held stationary in the left hand



JOHNSON COÖRDINATION TEST

while the needle was put on it. This method took a shorter time than when the child tried to put the thread through the eye of the needle with the left hand. When the needle was held in the left hand and the thread put through with the right, in most instances the time-record was shorter. Some of the children had very unsteady hands, sometimes a continuous tremor was noticeable and sometimes the hands would jerk. This was a test in which the left hand certainly showed poorer motor coördination than the right.

In some cases the child would fail to see that the center part of the long eye had a wider opening than the top or bottom, and would make many futile

The shortest time taken for this test was 29 seconds, found in the San Diego American group: in this group is also found the longest time-record, 450 seconds.

The medians for this test appear rather high. In the averages the San Diego American group makes the best record:

	AVER- AGE TIME	MEDIAN
	seconds	
San Diego Americans:		
Boys.....	118	} 100
Girls.....	144	
Sicilians:		
Boys.....	118	} 110
Girls.....	155	
Mexicans:		
Boys.....	138	} 114
Girls.....	139	
Baltimore Americans:		
Boys.....	145	} 125
Girls.....	125	

MOTOR COÖRDINATION

Another coördination test was given using the blanks of the Hopkins series of coördination tests. Since they are not numbered, a blank is inserted in this test to show the size of the design. The instructions were: "I want you to draw a line in the middle of this path as fast as you can go from this point to this point. Take your pencil this way and keep your arm up from the paper." (I illustrated the method by holding my pencil vertically and drawing an imaginary line in the path all the way across.) After this method of instruction no other difficulties were encountered except in the position of holding the pencil, in order to keep the hand up from the table. This position was well maintained if the

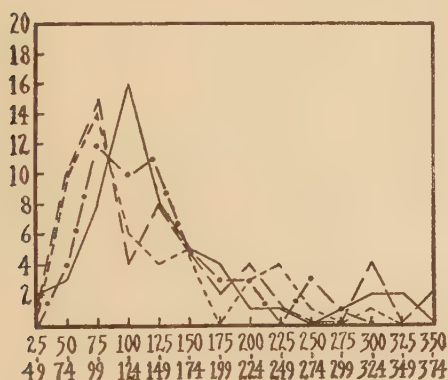


FIG. 4. RELATIVE TIME SCORES. THREADING NEEDLES

———— Mexican; ——— Italian; —··— S. D. American; —●— Baltimore American.

attempts to put the thread through where the opening was too small. The time was also prolonged when the child would split or bend one end of the thread and had to turn the thread around and use the other end.

child were watched and reminded to hold his hand up in case he forgot.

When the child's hand was in position, the signal was given "Ready, go!" The time was kept with a stop-watch.

Some of the children went slowly in order to keep in the middle of the path, others, perhaps keeping the time element in mind, went fast. Some drew the line lightly and showed very poor coördination, others whose hands appeared just as unsteady bore down heavily on the pencil giving a very steady, firm looking result. There were some who dashed along the path letting the line strike the sides again and again. When this happened in the first response, and it appeared that he had not really understood the import of the instructions, "in the middle of the path," was repeated.

The time varied from a record of 6 seconds for a line, up to 21 or 22 seconds.

The score was the sum of all the contacts with the sides of the path found in the 4 designs on the blank. The contacts recorded were from 0 to 37, and the averages were as follows:

	AVER- AGE CON- TACTS	MEDIAN
Baltimore Americans:		
Boys.....	6	6
Girls.....	8	
Mexicans:		
Boys.....	9	7
Girls.....	6	
San Diego Americans:		
Boys.....	9	8
Girls.....	9	
Sicilians:		
Boys.....	11	9
Girls.....	9	

Left hand

It was very noticeable that when the children were making a great effort to draw a steady line in the path, the left hand would press down heavily on the paper. Sometimes when the tension was great, in trying to draw the line quickly, the child would hold his left hand in a fist on the paper.

STRING BUTTONS

The last test given in this series was the stringing of 36 wooden button-

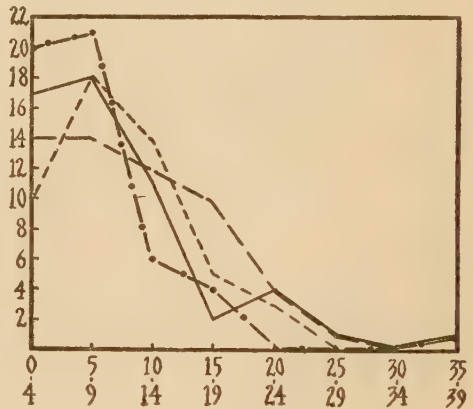


FIG. 5. RELATIVE NUMBER OF CONTACTS. MOTOR COÖRDINATION

———— Mexican; — — — Italian; . . . S. D. American; —●—●— Baltimore American.

molds on a round shoestring. The button-molds were circular, flat on one side and convex on the other, with a hole in the center $\frac{1}{8}$ inch in diameter, so the button slipped easily on the string. The string had a knot at one end and a tin tip at the other.

The buttons were placed in a shallow pan. The child was given the tip-end of the string and the directions were: "See how fast you can string all these

buttons on this string picking up only one at a time. Ready, go!"

The children who had been in the kindergarten were very familiar with this performance and that fact doubtless had some effect upon the scores obtained. Many seemed to take the attitude of settling back and taking it easy. A number of the children chattered about home, brothers and sisters and other things until reminded to hurry. There were many others, however, who kept up the spirit of playing a game until the end, and these children made the best time-scores.

The children used many different methods of accomplishing this task. Some of the children took the string in the right hand and put the buttons on with the left hand, and others reversed this process. Some kept the bunch of strung buttons on the table and drew the string through each time as if sewing with a very long thread.

There were those who let the bunch of strung buttons lie on the floor, and as they strung the single buttons on would let those buttons drop to the floor without giving them any further attention; others would shove each button all the way down the string until it reached those already strung.

Sometimes the entire time would be lengthened by the fact that the string was held in the right hand and the bunch of buttons strung dropped to the floor on the opposite side, so the button had to be shoved down the string each time. Only a few of the children let the buttons fall wherever they chanced to, without giving them further thought. There was one method that lengthened what otherwise would have been a short-time score. The

arrangement of string and bunch of buttons would be good, the child would let the buttons drop down the string giving them no more attention, once they were on the string, but every few seconds he would hold up the bunch of strung buttons for one to admire, with the remark; "See what a lot I have strung," or "It looks like a big worm." It was noticeable throughout the 3 nationalities, that

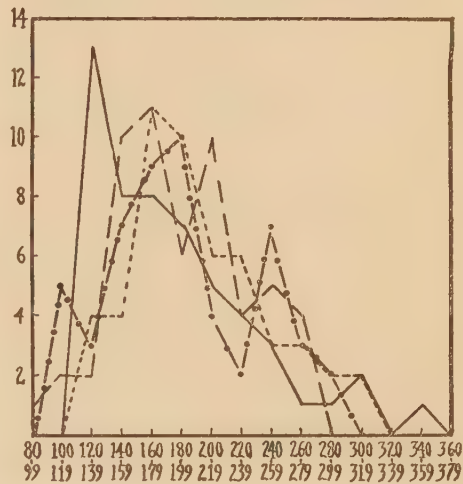


FIG. 6. RELATIVE TIME SCORES. STRINGING BUTTONS

—— Mexican; ——— Italian; ——— S. D. American; ●—●— Baltimore American.

most of the children put the string through the button from the flat side, few of the children had a hit or miss arrangement on this particular point. Three children strung first from the convex side then from the flat side giving an entirely different appearance to the finished product. One of these children would remove a button and string from the reverse side if he chanced to put one on wrong. These

children's records were among the long-time ones.

There were a goodly number of children who retained the idea of its being a timed test throughout, and who started out with the string in the left hand, the knotted end on the floor to the left, and who put the buttons on the string rapidly with the right hand letting them drop wherever they happened to. These were the children who made the shortest time-records.

The shortest time was made by a Sicilian child, 98 seconds; the longest time-record by a Sicilian child also, 386 seconds.

The averages are as follows:

	AVER- AGE TIME	MEDIAN
	<i>seconds</i>	
Mexicans:		
Boys.....	190	} 169
Girls.....	184	
Baltimore Americans:		
Boys.....	191	} 185
Girls.....	188	
Sicilians:		
Boys.....	195	} 187
Girls.....	191	
San Diego Americans:		
Boys.....	206	} 197
Girls.....	199	

The above averages show that the Mexican children made a slightly better record than the children of the other groups.

SUMMARY

A comparative study of racial differences in manual dexterity has been made for Sicilian, Mexican, and native American children, the criterion of race being the birthplace of their par-

ents. There were 2 groups of American children, one from the Atlantic coast and of favored social status, the other from the Pacific coast and of approximately same economic level as the Mexicans.

There were 212 children between the ages of four and seven tested, almost evenly distributed among the race groups. The sex differences within the groups were not so well equated.

Two forms of tests were given for obtaining an approximation of the mental level of the children in relation to standards for children of these ages. The scores for the Goodenough Drawing Test gave intelligence quotients that ranged from 70-170; these quotients were above the norm or 100 for 77 per cent of the Mexicans; 60 per cent of the Eastern Americans; 58 per cent of the Sicilians; 56 per cent of the Western Americans. For the Picture Puzzle series there are no norms. The scores compare favorably with the similar Rossolimo series and show that the group as a whole do as well as a larger group of American children. The Mexicans showed superiority in this test.

There were 8 performances in which manual dexterity played an important part. The Mexicans ranked highest in four of these tests and tied for superiority in another test. Their average rank on the series was 1.7; Baltimore Americans 2.3; Sicilians and San Diego Americans 2.8 each. For these groups the Mexicans are clearly superior in the quickness and accuracy of manipulation such as the tests involved. The conclusion can not be drawn for Latin races and not

for races in general. It does appear that certain racial groups or stocks develop early skill in manipulation greater than that of the average of

American children. A control of the environments from the first months might throw light on the origin of such differences.

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VITA

Emily Oothout Lamb was born in the village of Orleans, New York, on September 27th, 1876. She attended the Phelps Union and Classical School, where she received her High School training. At the age of sixteen she entered the State Normal School of Brockport, New York, and from there went to Pratt Institute, Brooklyn, New York. For one year she taught Art in the Public School of Newton, New Jersey; then for two years in the State Normal School of Shippensburg, Pennsylvania. From 1900-1905 she was a teacher in the High School of Santa Barbara, California, and Supervisor of Art in the Elementary Schools; from 1906-1914 she taught in the San Diego State Normal School. In 1915-16 she studied at Stanford University, receiving the B. A. degree in 1916. For the subsequent two years she did work in Applied Psychology in the public schools of Santa Barbara, also doing psychological work for the Juvenile Court of the County and City of Santa Barbara. In 1918 she left the public schools to do clinical work in Psychology for the Santa Barbara County Juvenile Court and Social Agencies, remaining in this position until entering the department of Psychology of The Johns Hopkins University in the fall of 1925. She studied at The Johns Hopkins University two years and was permitted to take the final examinations for the Ph. D. degree in June, 1927, being allowed to complete her dissertation "in absentia" during the year 1927-28.

